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David McMinn completed a BSc at the University of Melbourne in 1971 and subsequently worked as a mineral economist in ANZ Banking Group Ltd (a major Australian financial institution). Since leaving this position in 1982, he has conducted private research on cycles, with his main interests centering on the 9/56 year grid and lunisolar cycles. These involved new innovative concepts in cycle studies well outside prevailing paradigms in economics and the sciences. McMinn has published numerous papers and articles in the fields of cycles, technical analysis and seismology, as well as three books on market timing.

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9/56 YEAR CYCLE: FINANCIAL CRISES

David McMinn

Abstract: The 9/56 year cycle consists of a grid repeating the intervals 56 years vertically (called sequences) and 9 years horizontally (called subcycles). Since 1760, US and Western European financial panics have clustered with significance in this grid pattern. Seasonality was also observed within the 56 year sequences and within the 18/56 year grids. Artifact subcycles were also apparent within this cycle as shown by the 20 year subcycles. The 9/56 year pattern can be intimately linked to Moon – Sun cycles and thus it is hypothesized that lunisolar tidal harmonics activated financial panics within the 9/56 year grid.

Keywords: 9/56 year cycle, financial panics, seasonality, artifact subcycles,

Introduction

A 56 year panic cycle in US financial activity was first proposed by J M Funk (1932). McMinn (1986, 1993, 1994) expanded upon this concept and presented a 9/56 year cycle in the timing of major US and Western European financial crises over recent centuries. This cycle consists of a grid repeating intervals of 56 years on the vertical (called sequences) and 9 years on the horizontal (called subcycles). Major historic financial crises clustered statistically within this 9/56 year pattern, which may be linked intimately with Moon Sun cycles. Several Moon Sun cycles aligned very closely at 9.0 and 56.0 solar years and thus lunisolar tidal harmonics are hypothesised to activate panic events within the 9/56 year grid.

No definition exists of what constituted a 'major' crisis in economic history. Thus Appendix 1 gives a list by Kindleberger (Appendix B, 1996) of what he considered were 'major' financial crises over recent centuries. This source was chosen given his pre-eminence as an historical economist and because he presented the most comprehensive listing of major historic crises. The list provided an external reference independent of this cycle study. Years in which these major crises occurred have been given in **BOLD** throughout the text.

The 56 year sequences have been numbered in accordance with McMinn (1993), with 1817, 1873, 1929, 1985 being designated as Sequence 01, 1818, 1874, 1930, 1986 as Sequence 02 and so forth. The full numbering for the 9/56 year cycle has been presented in Appendix 3. In the various tables, the year of best fit was taken as the year beginning March 31. The term season was applied to a given period during the solar year, rather than the traditional seasons – spring, summer, autumn and winter. Additionally, Appendix 4 gives the essential background information on the various Moon Sun cycles and the terms used in this paper.

The 56 Year Sequences

Funk (1932) observed three 56 year panic sequences between 1817 and 1930 for the US economy. These have been denoted as Sequences 01, 21 and 41 and were expanded to cover the 1760 to 2010 era. His three sequences are presented as follows

Sq 01

- 1761 US downturn. Ending of the French & Indian War.
(Also British crisis - Jun - Dec).
- 1817 US recession. Resumption of specie payments in February.
? Listed as an 1817-1818 US crisis by Adams (1936).
- 1873** US Black Friday (Sep 19). Jay Cooke & Co failure.
(Also Austrian Black Friday (May 9). Vienna leasing crisis).
- 1929** US Black Tuesday (Oct 29). After New Era Prosperity.
- 1985 US\$ crisis (Sep 22). G 5 meeting. Plaza Accord.

Sq 21

- 1781 US deflation. Ending of the Revolutionary War.
- 1837** US panic (May 10). After Bank Credit Land Boom.
(Also British crisis - Dec **1836**).
- 1893** US panic (May - Jul). National Cordage Co failure.
US Black Wednesday (Jul 26). (Sobel, 1968).
- 1949 US recession.
- 2005 No Crisis

Sq 41

- 1801 US depression. After Carrying Trade Prosperity.
- 1857** US panic (Aug 24). Ohio Life Insurance & Trust Co failure.
US banking panic (Oct 14).
(Also British panic - Oct; Continental crises - Nov).
- 1913 1913-14 US & European war crises.
- 1969 US recession.

Astonishingly in the 100 years to 1930, Funk's three sequences contained 6 years, in which occurred five of the worst panics in US history (**1837**, **1857**, **1873**, **1893** and **1929**, the anomaly being 1913). Given the highly accurate trend, additional 56 year sequences were postulated to exist in recent centuries. References on US and Western European economic history were gleaned for such patterns with the ensuing sequences being regarded as the most significant.

Sq 03

- 1763** Amsterdam panic (Sep). Ending of Seven Years' War.
- 1819** US crises (Nov 1818 - Jun 1819).
British crisis.
- 1875 British crisis (Jun 15). Alexander Collie & Co failed. (Kitchin, 1933).
- 1931** Austrian crisis (May 11). Creditanstalt failure.
German crisis (Jul 13). Danatbank failure.
British crisis (Sep 20). Off gold standard.
- 1987** US Black Monday (Oct 19).
Worldwide stock market panics.

Sq 05

- 1765 US crisis. Stamp Act passed.

1821	No crisis
1877	1877-78 US 'sharp decline' (Sobel, 1965). Banking fears. Great rail strike.
1933	US banking crisis (Mar 6/9).
1989	Japanese crisis. After 'bubble economy' (Jan 1990). US Friday 13 stock market panic (Oct 13). German stock market panic (Oct 16).

Sq 12

1772	British panic (Jun 25). Ayr Bank failure. Amsterdam panic (Jan 1773).
1828	French crisis (Dec 1827). Bankruptcies in Alsace.
1884	US panic (May). After railway speculation.
1940	US panic (May). Germany invaded France.
1996	No crisis

Sq 32

1792	British panic (Feb 1793). After canal mania. US panic (Mar 22/23). William Duer bankruptcy.
1848	French panic (Mar). Year of Revolutions.
1904	French panic (Feb 20).
1960	No crisis.

Sq 48

1808	1807-08 US Embargo Depression.
1864	French panic (Jan). After cotton speculation. US panic (Apr 16/17) (Sobel, 1968). Civil War.
1920	USA & UK crises. After inflation.
1976	No crisis.

Sq 50

1810	British Great Panic (Jan 1811).
1866	British Black Friday (May 11). Overend Gurney failure. Italian crisis (May 1). Lira convertibility suspended.
1922	German crisis (Jan 1923). Default on war reparations.
1978	No crisis.

Sq 52

1812	No crisis.
1868	French crisis (Nov 1867). Credit Mobilier failure.
1924	French franc crisis (Mar 6) (Kindleberger, 1978).
1980	1979-80. US crises. Farmland (1979), US\$ (1979), Oil (1980). After silver mania (Silver Thursday - Mar 27).

The 9/56 Year Grid

The 56 year sequences are interconnected by intervals of 9 years as shown in **Table 1**. These 9 year sub-cycles operate for comparatively short periods, whereas the 56 year

sequences may persist for centuries. Kindleberger (Appendix B, 1996) listed some 30 major financial panics for the USA & Western Europe between 1760 and 1940 (see Appendix 1), of which 16 appeared in the 9/56 year grid appear in Table 1 (significant $p < .001$). For the period 1940-1996, numerous international currency crises were given in Kindleberger's listing, only two of which happened within the 9/56 year configuration. Even including these currency speculations, 21 of Kindleberger's 44 crisis years (1760-1996) fell in the 9/56 year pattern, which was still significant ($p < .01$).

Table 1
9/56 YEAR CYCLE: FINANCIAL PANICS 1760-1996

Year beginning March 1													
Sq 52	Sq 05	Sq 14	Sq 23	Sq 32	Sq 41	Sq 50	Sq 03	Sq 12	Sq 21	Sq 30	Sq 39	Sq 48	Sq 01
							1763	1772	1781	1790	1799	1808	1761
	1765	1774	1783	1792	1801	1810	1819	1828	1837	1846	1855	1864	1817
1812	1821	1830	1839	1848	1857	1866	1875	1884	1893	1902	1911	1920	1873
1868	1877	1886	1895	1904	1913	1922	1931	1940	1949	1958	1967	1976	1929
1924	1933	1942	1951	1960	1969	1978	1987	1996	2005	2014			1985
1980	1989	1998	2007	2016									

The 56 year sequences are separated by an interval of 9 years.

Years in **bold** contained major financial panics and crises listed by Kindleberger (Appendix B, 1996).

Source: McMinn (1993, 1994, 1996).

The main discrepancy occurs with the currency crises of the post war era. How well distress in currency markets correlates with the 9/56 year grid is debatable. Additional research may show that major financial crises align more readily with the 9/56 year cycle than do international currency crises.

The layout in **Table 1** contained most of the major financial disasters in US history – 1792, **1819**, **1837**, **1857**, **1873**, 1884, **1893**, **1920**, **1929**, **1931**, **1933**, **1987**, 1998 and 2007. Listings of US & Western European crises by other economists also fell selectively in the same 9/56 year grid (see Appendix 2). Such findings offered further support for a 9/56 year panic cycle. Amazingly, this cycle has persisted since at least the mid-17th century, despite the radical changes in technology, financial complexity, economic structures and so forth.

Seasonality

Within the 56 year sequences, crises often take place at around the same time of the year, a trend that held up reasonably well over recent centuries. Additional examples have been given by McMinn (1995). The crisis month is given wherever possible in the text.

Sq 01 - **1873** (USA – Sep), **1929** (USA – Oct), 1985 (US\$ - Sep).

Table 2									
18/56 YEAR CYCLE: SEASONALITY OF FINANCIAL PANICS									
Year beginning March 1									
Grid A									
Sq 41		Sq 03		Sq 21		Sq 39		Sq 01	
									1761
		1763	+18	1781	+18	1799	+18		1817
1801	+18	1819	+18	1837	+18	1855	+18	1873	
1857	+18	1875	+18	1893	+18	1911	+18	1929	
1913	+18	1931	+18	1949	+18	1967	+18	1985	
1969	+18	1987	+18	2005					
Grid B									

Sq 32		Sq 50		Sq 12		Sq 30		Sq 48
1792	+18	1810	+18	1772	+18	1790	+18	1808
1848	+18	1866	+18	1828	+18	1846	+18	1864
1904	+18	1922	+18	1884	+18	1902	+18	1920
1960	+18	1978	+18	1940	+18	1958	+18	1976
2016				1996	+18	2014		

Years in **bold** contained major financial panics and crises listed by Kindleberger (Appendix B, 1996).

Source: McMinn (1993, 1994, 1996).

Artifact Subcycles

Numerous other patterns can be generated from the grids based on intervals of 56 years and multiples of 9 years. These included subcycles of 20 years, 47 years, 65 years and so forth. Because they were derived from the 9/56 year cycle, they have been described as ‘artifact’ sub-cycles (McMinn, 2002). The following only discusses the 20 year sub-cycles, which are the most obvious subcycles in economic history and were first observed by Funk (1932).

20 year sub-cycles are to be found between Funk's Sequences 01, 21, 41 on the diagonals of the 36 year sub-cycles (see Table 3).

Table 3
36/56 YEAR CYCLE: FINANCIAL PANICS 1760-1996
Year beginning March 1

Sq 05		Sq 41		Sq 21		Sq 01
						1761
				1781	+ 36	1817
1765	+ 36	1801	+ 36	1837	+ 36	1873
1821	+ 36	1857	+ 36	1893	+ 36	1929
1877	+ 36	1913	+ 36	1949	+ 36	1985
1933	+ 36	1969	+ 36	2005		
1989						

The 36/56 year grid may be reconstructed to give 20 year sub-cycles (see Table 4).

Table 4
20/56 YEAR CYCLE: FINANCIAL PANICS 1760-1996
Year beginning March 1

Sq 01		Sq 21		Sq 41		Sq05
1761	+ 20	1781	+ 20	1801	+ 20	1821
1817	+ 20	1837	+ 20	1857	+ 20	1877
1873	+ 20	1893	+ 20	1913	+ 20	1933
1929	+ 20	1949	+ 20	1969	+ 20	1989
1985	+ 20	2005				

The most notable 20 year sub-cycle in US history has been presented as follows:

Sq 01	1873	Austrian Black Friday (May 9) US Black Friday (Sep 19)
Sq 21	1893	US Black Wednesday (Jul 26)
Sq 41	1913	1913-14 US war crises
Sq 05	1933	US banking crisis (Mar 6)

Other Phenomena

Given the favourable findings for financial panics, a 9/56 year effect was hypothesised to arise in the timing of other phenomena. Remarkably 9/56 year trends were established for earthquakes (McMinn, 2011a, 2011b, 2011d), Category 5 Atlantic hurricanes (McMinn, 2011c), Hawaiian volcanoes (McMinn, 2011d) and world mega eruptions (McMinn, 2012).

Discussion and Conclusions

The obvious question emerges as to what causes the 9/56 year effect, especially as it appears so strongly in financial patterns. Excellent Moon Sun correlates can be produced with any events that cluster within the 9/56 year grid. The lunar ascending node will be sited in two segments approximately 180 degrees opposite on the ecliptic circle, **WITH NO EXCEPTIONS** (1st and 2nd harmonics). All events in a particular 56 year sequence have the lunar ascending node sited in a narrow sector of the ecliptic circle **WITH NO EXCEPTIONS** (1st harmonic). For events occurring at a similar time of year and within the 9/56 year grid, the apogee point will be found in three ecliptic segments 120 degrees apart **WITH NO EXCEPTIONS** (3rd harmonic). Any events happening around the same time of year and in the same 9 year subcycle will have apogee in the same sector of the ecliptic **WITH NO EXCEPTIONS** (1st harmonic). These properties of the 9/56 year grid arise from the very close alignments of several lunisolar cycles at 9.0 and 56.0 solar years (see Appendix 4). Presumably lunisolar tidal harmonics triggered critical events, as the Moon, Sun, ascending node and apogee were prime factors in terrestrial tides. Many studies have supported a lunar phase effect in stock market activity (Dichev & Janes 2003; Yuan et al, 2006). It is not a question of whether the Moon and Sun influence investor trading, but how strong is the effect. From the 9/56 year cycle, the lunisolar influence may be far greater than previously considered possible

How lunisolar cycles activated critical events remained a mystery. The Moon and Sun are hypothesized influencing mass physiological cycles of the general population, which determine the prevailing collective mood and thus financial outcomes. Hormone levels of animals and humans have been shown to fluctuate over the lunar month (Endres Schaad, 2002; Zimecki, 2006). Cajochen et al (2013) established that humans achieve 30% less deep sleep during the full Moon, which presumably would affect human behavior. Various studies have also linked hormone levels to market trading success (Chen et al, 2005; Coates & Hebert, 2008; Coates et al, 2009). Anyone who is able to crack the Moon Sun effect will be able to make accurate market forecasts years in advance. Such information will probably never be published given the potential profits to be made.

What can be stated with a high degree of confidence is that major US and Western European financial crises happen preferentially within the 9/56 year grid. The crises also often occur at around the same time of year within a given 56 year sequence. The 9/56 year cycle is complex as many integral numbers (based on the solar year) may be given significance.

The 9/56 year tidal effect is hypothesized to arise from the varying angles between the Moon, Sun, lunar ascending node, apogee and the spring equinox point (see Appendix 4). Diurnal cycles may also be relevant, but they have not been considered in this paper. Lunisolar tidal harmonics are the best options for further study. All too often researchers undertake studies testing only one Moon Sun factor (in academic finance this has always been lunar phase). Unfortunately, the real situation is far more complicated.

If the Moon Sun mathematics can ever be deciphered, accurate predictions could be given of windows when financial upheavals were most likely to occur. However, current understanding of the 9/56 year effect remained extremely limited. Hopefully this paper will assist in the design of much needed follow up research.

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Appendix 1

MAJOR FINANCIAL CRISES - KINDLEBERGER (Appendix B, 1996).

1618-23	Holy Roman Empire. SP - Feb 1622. C - Feb 1622. Coin debasement.
1636-37	Dutch Republic. SP - Feb 1637. C - Feb 1637. After tulip mania.
1720	Britain. South Sea Bubble. SP - Apr 1720. C - Sep 1720
	France. Mississippi Bubble. SP - Sep 1719. C - May 1720.
1763	Amsterdam. SP - Jan 1763. C - Sep 1763. End of Seven Years' War.
1772	Britain. C - Jun 1772. Amsterdam. SP - Jun 1772. C - Jan 1773.
1793	Britain. SP - Nov 1792. C - Feb 1793. After canal mania.
1797	Britain. SP - 1796. C - Feb-Jun 1797.
1799	Hamburg. SP - 1799. C - Aug-Nov 1799.
1810	Britain. SP - 1809. C - Jan 1811.
1815-16	Britain. SP - 1815. C - 1816.
1819	USA. SP - Aug 1818. C - Nov 1818-Jun 1819.
	Britain. SP - Dec 1818. C - None.
1825	Britain. SP - Early 1825. C - Dec 1825.
1828	France. SP - MNG. C - Dec 1827.
1836	Britain. SP - Apr 1836. C - Dec 1836.
1837	USA. SP - Nov 1836. C - Sep. (error - May correct ?).
1838	France. SP - Nov 1836. C - Jun 1837. (error - Jun 1838 correct ?)
1847	Britain. SP - Jan 1847. C - Oct. After railway mania.
1848	Continent. SP - Mar - Apr 1848. C - Mar 1848.
	USA. SP - Late 1856. C - Aug 1857.
1857	Britain. SP - Late 1856. SP - Oct 1857.
	Continent. SP - March 1857. C - Nov 1857.
1864	France. SP - 1863. C - Jan 1864.
1866	Britain/Italy. SP - Jul 1865. C - May 1866
1873	Germany/Austria. SP - Autumn 1872, C - May 1873.

	USA. SP - March 1873. C - Sep 1873.
1882	France. SP - Dec 1881, C - Jan 1882. Union Generale failure.
1890	Britain. SP - Aug 1890. C – Nov 1890. Baring crisis.
1893	USA. SP - Dec 1892. C - May 1893. Australia SP - . C – May.
1907	USA. SP - Early 1907. C - Oct 1907.
	France/Italy. SP - Mar 1906. C - Aug 1907.
1920-21	USA/ UK. SP - Summer 1920. C - Spring 1921.
1929	1929 USA. SP - Sep. C - Oct 29. Black Tuesday.
1931-33	1931 Austria. C - May. Germany. C - Jun. UK. C - Sep. Japan. C – Dec.
	1933 USA. C - March. Bank holiday.
1950's & 1960's	Currency speculations: France 1958, Canada 1962, Italy 1963, Britain 1964, France 1968, US\$ 1973.
1974-75	Worldwide. SP - 1973. C - 1974.
1979-82	USA crises: SP - 1979. Farmland (C - 1979), US\$ (C - 1979), Oil (C - 1980), Third world debt (C - 1982).
1982-87	USA crises: US\$ (SP - 1985), Real Estate (SP - 1987), Stocks (SP - 1987, C - Oct 1987).
1990	Japanese panic. SP – Dec. C - Jan.

Abbreviations: SP- Speculative peak. C- Crisis/Panic. MNG- Month not given.

Appendix 2

THE 9/56 YEAR CYCLE AND LISTINGS OF FINANCIAL CRISES

Source	Era	Total	Year beginning March 1	
			Appearing in Table 1	Probability
Kindleberger (1996)	1760-1940	30	16	p < .001
	1760-1996	44	21	p < .01
Kitchin (1933)	1796-1933	38	16	p < .05
Adams (1936)	1763-1933	31	15	p < .01
Encyclopedia Americana (1995)	1672-1949	31	16	p < .001

Years *asterisked below appeared in **Table 1**.

Sources. Kindleberger (Appendix B 1996). 1760-1996. 1763*, 1772*, 1793 (Jan)*, 1797, 1799*, 1811 (Jan)*, 1815-1816, 1819*, 1825, 1828, 1836-1837*, 1838, 1847-1848*, 1857*, 1864 (Jan), 1866*, 1873*, 1882 (Jan), 1890, 1893*, 1907, 1920*-1921, 1929*, 1931*-1932-1933*, 1958*, 1962, 1963, 1964, 1968, 1973, 1974-1975, 1979, 1980*, 1982, 1985*, 1987*, 1990 (Jan)* .

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Encyclopedia Americana (1995). Vol 21 p 358. US & Wn European crises 1672-1932: 1672 (Jan)*, 1692 (error - 1696* correct?), 1720, 1763*, 1793* (Jan 1793), 1825, 1836-1837*, 1847, 1857*, 1866*, 1869, 1873*, 1882 (Jan), 1884*, 1889-1890, 1900, 1904*, 1907, 1914, 1920*, 1929*-1930-1931*-1932.

Vol 5, p 46-47. US crises 1837-1949: 1837*, 1873*, 1882, 1883, 1884*, 1893*, 1920*, 1929*-1930-1931*-1932-1933*, 1937, 1946, 1949*.

Kitchin (1933). Major US/Wn European crises 1796-1933: 1796, 1801*, 1810*, 1818, 1825, 1836, 1847, 1857*, 1866*, 1873*, 1881 (Jan 1882), 1890, 1900, 1907, 1913*, 1920*, 1929*-

1930-1931*-1932-1933*.

Minor US/Wn European crises 1799-1914: 1799*, 1805, 1814, 1831, 1839*, 1845, 1854, 1860-1861, 1863-1864*, 1870, 1875*, 1878, 1884*, 1893*, 1914.

Appendix 3

NUMBERING THE 56 YEAR SEQUENCES

McMinn (1993) numbered the 56 year sequences by denoting Sequence 01 as 1761, 1817, 1873, 1929 1985, Sequence 02 as 1762, 1817, 1873, 1929, 1986 and so forth. The complete numbering for the 9/56 year grid is shown in Table A.

Table A Appendix 3
THE COMPLETE 9/56 YEAR CYCLE – 1760-2012

Sq 52	Sq 05	Sq 14	Sq 23	Sq 32	Sq 41	Sq 50	Sq 03	Sq 12	Sq 21	Sq 30	Sq 39	Sq 48	Sq 01
													1761
							1763	1772	1781	1790	1799	1808	1817
	1765	1774	1783	1792	1801	1810	1819	1828	1837	1846	1855	1864	1873
1812	1821	1830	1839	1848	1857	1866	1875	1884	1893	1902	1911	1920	1929
1868	1877	1886	1895	1904	1913	1922	1931	1940	1949	1958	1967	1976	1985
1924	1933	1942	1951	1960	1969	1978	1987	1996	2055	2014			
1980	1989	1998	2007										
Sq 10	Sq 19	Sq 28	Sq 37	Sq 46	Sq 55	Sq 08	Sq 17	Sq 26	Sq 35	Sq 44	Sq 53	Sq 06	Sq 15
												1766	1775
						1768	1777	1786	1795	1804	1813	1822	1831
1770	1779	1788	1797	1806	1815	1824	1833	1842	1851	1860	1869	1878	1887
1826	1835	1844	1853	1862	1871	1880	1889	1898	1907	1916	1925	1934	1943
1882	1891	1900	1909	1918	1927	1936	1945	1954	1963	1972	1981	1990	1999
1938	1947	1956	1965	1974	1983	1992	2001	2010					
1994	2003	2012											
Sq 24	Sq 33	Sq 42	Sq 51	Sq 04	Sq 13	Sq 22	Sq 31	Sq 40	Sq 49	Sq 02	Sq 11	Sq 20	Sq 29
										1762	1771	1780	1789
			1755	1764	1773	1782	1791	1800	1809	1818	1827	1836	1845
1784	1793	1802	1811	1820	1829	1838	1847	1856	1865	1874	1883	1892	1901
1840	1849	1858	1867	1876	1885	1894	1903	1912	1921	1930	1939	1948	1957
1896	1905	1914	1923	1932	1941	1950	1959	1968	1977	1986	1995	2004	
1952	1961	1970	1979	1988	1997	2006							
2008													
Sq 38	Sq 47	Sq 56	Sq 09	Sq 18	Sq 27	Sq 36	Sq 45	Sq 54	Sq 07	Sq 16	Sq 25	Sq 34	Sq 43
									1767	1776	1785	1794	1803
		1760	1769	1778	1787	1796	1805	1814	1823	1832	1841	1850	1859
1798	1807	1816	1825	1834	1843	1852	1861	1870	1879	1888	1897	1906	1915
1854	1863	1872	1881	1890	1899	1908	1917	1926	1935	1944	1953	1962	1971
1910	1919	1928	1937	1946	1955	1964	1973	1982	1991	2000	2009	2018	
1966	1975	1984	1993	2002	2011								

Appendix 4

MOON SUN BACKGROUND INFORMATION

Apogee

Apogee is the point in the lunar orbit, where the Moon is the greatest distance from Earth, while perigee is the least distance. In the lunar apse cycle, the apogee – perigee axis (apsides) rotates counter clockwise around the ecliptic circle, with apogee completing one cycle from spring equinox to spring equinox every 8.8474 tropical years. The apsides is very important in oceanic tides on Earth. When the full/new Moon is at apogee, the amplitude of tides in New York Harbor is 50% lower than when the full/new Moon is at perigee. Apogee could be expected to play a key role in any Moon Sun tidal effect.

9.0 divided by the 8.8474 year apse cycle yielded 1.02, while 56.0 divided by the apse cycle gave 6.33 (6 plus one third). Thus, every 9.0 years apogee will be sited about 6 degrees further anticlockwise on the ecliptic circle. Every 56.0 years, apogee will be located 120 degrees further anticlockwise on the ecliptic circle. For events occurring around the same time of year in the 9/56 year grid, apogee is always located in three segments approximately 120 degrees apart on the ecliptic circle. For example, **Table A** gives the apogee position as on July 1 of those years in a 9/56 year grid. Apogee was always located in three segments 120 degrees apart 335 – 015 E°; 095 – 135 E° and 215 – 250 E° (3rd harmonic).

Table A Appendix 4
9/56 YEAR CYCLE & THE POSITION OF APOGEE
Ecliptic Degree of Apogee on July 1

Sq 32	Sq 41	Sq 50	Sq 03	Sq 12	Sq 21
			1763	1772	1781
			000	007	013
1792	1801	1810	1819	1828	1837
100	106	113	119	126	131
1848	1857	1866	1875	1884	1893
219	225	231	237	244	250
1904	1913	1922	1931	1940	1949
337	344	350	356	002	008
1960	1969	1978	1987	1996	2005
096	102	108	115	121	127

The 56 year sequences are separated by an interval of 9 years.

Equinoxes

These imaginary points are located where the plane of the Earth's equator projected out onto the sky (celestial equator) cuts the plane of the Earth's orbit around the Sun (ecliptic). The vernal or spring equinox (000 E°) occurs around March 20 and is sited where the Sun crosses the celestial equator from south to north. The autumnal equinox (180 E°) happens around September 22 and is located where the Sun crosses the celestial equator from north to south.

Lunar Ascending Node

The lunar nodes are sited, where the plane of the Earth's orbit around the Sun (the ecliptic) is cut by the plane of the Moon's orbit around the Earth. The ascending (north) node is where the Moon crosses the ecliptic from south to north, whereas the descending (south) node is where the Moon crosses from north to south. In the lunar nutation cycle, it takes 18.62 years for the ascending node to complete one cycle from spring equinox to spring equinox.

The ecliptic position of the lunar ascending node in a 9/56 year grid is presented in **Table B**. On July 1, this point is always found in two segments approximately 180 degrees apart in the ecliptic circle (1st and 2nd harmonics). In any particular 56 year sequence, the lunar node is always found in a narrow sector of the ecliptic circle (1st harmonic).

Table B Appendix 4
9/56 YEAR CYCLE &
THE POSITION OF THE LUNAR ASCENDING NODE
Ecliptic Degree of Lunar Ascending Node on July 1

Sq 32	Sq 41	Sq 50	Sq 03	Sq 12	Sq 21
			1763	1772	1781
			019	205	031
1792	1801	1810	1819	1828	1837
178	004	190	016	202	028
1848	1857	1866	1875	1884	1893
175	001	187	013	199	025
1904	1913	1922	1931	1940	1949
172	358	184	010	196	022
1960	1969	1978	1987	1996	2005
169	355	181	007	193	019

The 56 year sequences are separated by an interval of 9 years.

Moon Sun Cycles.

The 9/56 year effect arises due to a very close alignment of several lunisolar cycles at 9.0 and 56.0 solar years (see **Table C**). NB: The synodic month (or lunar month) is the time taken for the Moon and Sun to complete one cycle new Moon to new Moon and is the basic time unit in the cycles discussed in this appendix.

Relative angles between the Moon, Sun, ascending node and apogee repeat very closely every 223 synodic months (or one 18.0 year cycle). These angles will also recur in similar ecliptic positions - plus about 11 degrees anticlockwise on the ecliptic circle every 223 synodic months. This cycle is called the Saros and was originally discovered by the ancient Babylonians.

223 synodic months divided by two gives the Half Saros of 111.5 synodic months. Every 9.0 tropical years, the Moon repeats the same angle to the ascending node, with the Sun 180 degrees on the opposite side of the angular circle. The apogee - Sun angle is similar, while the Moon - apogee angle changes in multiples of 60 degrees.

On the same date every 56 years, the lunar ascending node is located a further 3 E° clockwise on the ecliptic circle (eg: as on July 1: 1761 at 48 E°; 1817 - 45 E°; 1873 - 42 E°; 1929 - 39 E°; 1985 - 36 E°). This reflects a close alignment between the 18.6 year lunar nutation cycle and the solar year. Every 692.5 synodic months (or one 56.0 year cycle), the Sun forms the same angle to the ascending node with the Moon 180 degrees on the opposite side of the angular circle. The relative angles of apogee to the Moon, Sun and ascending node change in multiples of 60 degrees.

Table C Appendix 4
9 & 56 YEAR LUNISOLAR CYCLES

18.0 Year Saros		
Days	Years	Lunisolar cycles

6,574.36	18.00	18.0 Tropical Years
6,585.78	18.03	19.0 Nodical Years
6,585.32	18.03	223.0 Synodic Months (Saros cycle)
6,584.51	18.03	241.0 Tropical Months
6,585.35	18.03	242.0 Nodical Months
6,585.55	18.03	239.0 Apogee Months

9.0 Year Half Saros

Days	Years	Lunisolar Cycles
3,287.18	9.00	9.0 Tropical Years
3,292.89	9.02	9.5 Nodical Years
3,292.66	9.02	111.5 Synodic Months (Half Saros cycle)
3,292.26	9.01	120.5 Tropical Months
3,292.68	9.02	121.0 Nodical Months
3,292.77	9.02	119.5 Apogee Months

56.0 Year Cycle

20,453.44	56.00	56.0 Tropical Years
20,450.58	55.99	59.0 Nodical Years
20,449.94	55.99	692.5 Synodic Months (56 Year Cycle)
20,450.23	55.99	748.5 Tropical Months
20,449.97	55.99	751.5 Nodical Months
20,450.06	55.99	742.17 Apogee Months

Synodic Month (or Lunar Month) is the interval between successive new Moons and is equal to 29.5306 days.

Tropical Year (or Solar Year) is the time taken for the Sun to complete one cycle of the ecliptic from spring equinox to spring equinox and is equal to 365.2422 days.

Tropical Month is the time taken for the Moon to complete one cycle of the ecliptic from spring equinox to spring equinox and is equal to 27.3216 days.

Nodical Month (or Draconic Month) is the time taken for the Moon to complete one cycle from ascending node to ascending node and is equal to 27.2122 days.

Nodical Year (or Eclipse Year) is the time taken for the Sun to complete one cycle from ascending node to ascending node and is equal to 346.6201 days.

Apogee Month (or Anomalistic Month) is the time taken for the Moon to complete one cycle from apogee to apogee and is equal to 27.5546 days.

Source: McMinn, 1995.

These cycles of 111.5 and 692.5 synodic months repeat the angles of 0 and 180 degrees between the Moon, Sun and ascending node very closely. Angles involving apogee repeat in multiples of about 60 degrees. Thus, any events clustering in a 9/56 year grid will always have the lunar ascending node in two sectors of the ecliptic approximately 180 degrees apart. Any events in a particular 56 year sequence will have the lunar ascending node in a narrow sector of the ecliptic. If the events occur around the same time of year and in the 9/56 year grid, then apogee will always be sited in three ecliptic sectors 120 degrees apart. If events occurred around the same time of year and in a particular 9 year subcycle, they will have apogee in one sector of the ecliptic circle.